

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) An electronic control unit comprising:

memory means for storing data;

operation means for performing various control operations based on a predetermined control program by using the data stored in the memory means, the control operations including a floating-point calculation in which a floating-point data is used;

non-numeric checking means for checking whether the floating-point data includes non-numeric; and

backup means for performing backup processing in place of the floating-point calculation using the floating-point data including the non-numeric, when the non-numeric is determined by the non-numeric checking means;-

wherein the non-numeric checking means performs non-numeric checking at idle time in the various central operations during normal operation of the operation means.

2. (Original) The electronic control unit as in claim 1, wherein:

the backup means includes data initializing means for initializing the data in the memory means when the existence of the non-numeric is determined by the non-numeric checking means.

3. (Original) The electronic control unit as in claim 2, wherein:

the data initializing means initializes the data in the memory means by writing into the memory means default values ineffective to control operations.

4. (Original) The electronic control unit as in claim 1, wherein:

the memory means is a non-volatile memory which maintains storing the data even when the operation means is in inoperative condition, and includes a storage area for storing the floating-point data; and

the non-numeric checking means, in system initialization processing performed at the time of starting the operations of the operation means, performs non-numeric checking for the storage area storing the floating-point data.

Claim 5 – cancelled without prejudice or disclaimer.

6. (Original) The electronic control unit as in claim 1, further comprising:

resetting means for resetting the operation means when the existence of the non-numeric is determined by the non-numeric checking means during normal operation of the operation means.

7. (Original) The electronic control unit as in claim 1, further comprising:

a watchdog circuit for monitoring a watchdog clear signal periodically produced from the operation means and outputting a reset signal to the operation means each time the periodicity of inversion of the watchdog clear signal is lost,

wherein the operation means discontinues inversion of the watchdog clear signal when the existence of the non-numeric is determined by the non-numeric checking means.

8. (Original) The electronic control unit as in claim 1, wherein:
the backup means includes interrupt disabling means for disabling all interrupts when the existence of the non-numeric is determined by the non-numeric checking means.

9. (Original) The electronic control unit as in claim 1, wherein:
the backup means initializes only the data in the storage means without resetting the operation means.

10. (Original) The electronic control unit as in claim 1, wherein:
the operation means is programmed to control an internal combustion engine.

11. (Original) The electronic control unit as in claim 1, wherein:
the non-numeric checking means checks whether the floating-point data used in the floating-point calculation is non-numeric for each floating-point calculation.

12. (Original) The electronic control unit as in claim 1, wherein:
the non-numeric checking means checks whether the floating-point data to affect the calculation is non-numeric for each floating-point calculation.

13. (Original) The electronic control unit as in claim 1, wherein:
the non-numeric checking means checks whether any one of all pieces of the floating-point data is non-numeric.

14. The electronic control unit as in claim 1, wherein:
the operation means sets non-numeric determination flag each time it is determined that the floating-point data is non-numeric;
the non-numeric checking means checks the non-numeric determination flag for non-numeric; and
the backup means performs the backup processing based on a result of checking the non-numeric determination flag.

15. (Original) The electronic control unit as in claim 1, wherein:
the backup means uses an integer data as a backup value instead of the floating-point data.

16. (Original) The electronic control unit as in claim 1, wherein:
the backup means performs calculations using integer data instead of the floating-point calculations.

17. (Original) The electronic control unit as in claim 1, wherein:
the backup means performs calculations using integer data when the non-numeric is found to exist, and the floating-point data including the non-numeric is initialized to a

default value after the calculation using the integer data has been completed or a predetermined time has elapsed.

18. (Original) An electronic control method for a vehicle comprising the steps of:

checking floating-point data for non-numeric, the floating-point data being for use in a calculation of a control value for the vehicle; and

disabling a use of the floating-point data including the non-numeric in the calculation of the control value, when a check result of the checking step indicates that the floating-point data includes the non-numeric.

19. (Original) The electronic control method as in claim 18, wherein:
the disabling step includes a step of initializing the floating-point data stored in a memory to a value which is ineffective to the calculation of the control value.

20. (Original) The electronic control method as in claim 18, wherein:
the checking step checks all floating-point data used and calculated in the course of calculation of the control value; and
the disabling step calculates the control value by replacing the floating-point data including the non-numeric with an integer value.

21. (New) An electronic control unit comprising:
memory means for storing data;

operation means for performing various control operations based on a predetermined control program by using the data stored in the memory means, the control operations including a floating-point calculation in which a floating-point data is used;

non-numeric checking means for checking whether the floating-point data includes non-numeric; and

backup means for performing backup processing in place of the floating-point calculation using the floating-point data including the non-numeric, when the non-numeric is determined by the non-numeric checking means;

resetting means for resetting the operation means when the existence of the non-numeric is determined by the non-numeric checking means during normal operation of the operation means.

22. (New) An electronic control unit as in claim 21 wherein:

the backup means includes data initializing means for initializing the data in the memory means when the existence of the non-numeric is determined by the non-numeric checking means.

23. (New) An electronic control unit as in claim 22 wherein:

the data initializing means initializes the data in the memory means by writing into the memory means default values ineffective to control operations.

24. (New) An electronic control circuit as in claim 21 wherein:

the memory means is a non-volatile memory which maintains storing the data even when the operation means is in inoperative condition, and includes a storage area for storing the floating-point data; and

the non-numeric checking means, in system initialization processing performed at the time of starting the operations of the operation means, performs non-numeric checking for the storage area storing the floating-point data.

25. (New) An electronic control circuit as in claim 21 wherein:

the non-numeric checking means performs non-numeric checking at idle time in the various control operations during normal operations of the operation means.

26. (New) An electronic control circuit as in claim 21 further comprising:

a watchdog circuit for monitoring a watchdog clear signal periodically produced from the operation means and outputting a reset signal to the operation means each time the periodicity of inversion of the watchdog clear signal is lost,

wherein the operation means discontinues inversion of the watchdog clear signal when the existence of the non-numeric is determined by the non-numeric checking means.

27. (New) An electronic control unit comprising:

memory means for storing data;

operation means for performing various control operations based on a predetermined control program by using the data stored in the memory means, the control operations including a floating-point calculation in which a floating-point data is used;

non-numeric checking means for checking whether the floating-point data includes non-numeric; and

backup means for performing backup processing in place of the floating-point calculation using the floating-point data including the non-numeric, when the non-numeric is determined by the non-numeric checking means;

a watchdog circuit for monitoring a watchdog clear signal periodically produced from the operation means and outputting a reset signal to the operation means each time the periodicity of inversion of the watchdog clear signal is lost,

wherein the operation means discontinues inversion of the watchdog clear signal when the existence of the non-numeric is determined by the non-numeric checking means.

28. (New) An electronic control unit comprising:

operation means for performing various control operations based on a predetermined control program, the control operations including a floating-point calculation in which a floating-point data stored in a memory means is used;

checking means for checking whether the memory means stores non-numeric data; and

resetting means for resetting the operation means during normal operation of the operation means, when the checking means determines an existence of the non-numeric data in the memory means.

29. (New) The electronic control unit as in claim 28, further comprising:
data initializing means for initializing data in the memory means before the operation means starts the normal operation, when the non-numeric checking means determines the existence of the non-numeric data in the memory means.

30. (New) The electronic control unit as in claim 29, wherein:
the data initializing means initializes the data in the memory means by writing into the memory means default values ineffective to control operations.

31. (New) The electronic control unit as in claim 29, wherein:
the memory means is a non-volatile memory which maintains storing the data even when the operation means is in inoperative condition, and includes a storage area for storing the floating-point data; and

the non-numeric checking means, in system initialization processing performed before starting the control operations, performs non-numeric checking for the storage area storing the floating-point data.

32. (New) The electronic control unit as in claim 28, wherein:

the non-numeric checking means performs non-numeric checking at idle time in the various control operations during the normal operations of the operation means.

33. (New) A method for suppressing control failures in an electronic control unit caused by non-numeric floating point data, said method comprising:

storing data in a memory;

performing various control operations based on a predetermined control program by using the data stored in the memory, the control operations including a floating-point calculation in which floating-point data is used;

checking whether the floating-point data includes a non-numeric value; and

performing backup processing in place of the floating-point calculation using the floating-point data including the non-numeric value, when the non-numeric value is determined by the non-numeric checking step,

wherein said checking step performs non-numeric checking at all times in the various control operations during normal control operation.

34. (New) A method for suppressing control failures in an electronic control unit caused by non-numeric floating point data, said method comprising:

storing data in a memory;

performing various control operations based on a predetermined control program by using the data stored in the memory, the control operations including a floating-point calculation in which floating-point data is used;

checking whether the floating-point data includes a non-numeric value; and
performing backup processing in place of the floating-point calculation using the floating-point data including the non-numeric value, when the non-numeric value is determined by the non-numeric checking step,

wherein said checking step performs non-numeric checking at all times in the various control operations during normal control operation, and

resetting the control operations when the existence of non-numeric is determined by the non-numeric checking during normal control operations.

35. (New) A method for suppressing control failures in an electronic control unit caused by non-numeric floating point data, said method comprising:

storing data in a memory;

performing various control operations based on a predetermined control program by using the data stored in the memory, the control operations including a floating-point calculation in which floating-point data is used;

checking whether the floating-point data includes a non-numeric value; and

performing backup processing in place of the floating-point calculation using the floating-point data including the non-numeric value, when the non-numeric value is determined by the non-numeric checking step,

wherein said checking step performs non-numeric checking at all times in the various control operations during normal control operation,

monitoring a watchdog clear signal periodically produced from the control operations and resetting the control operations each time the periodicity of inversion of the watchdog clear signal is lost,

discontinuing inversion of the watchdog clear signal when the existence of the non-numeric is determined by the non-numeric checking step.

36. (New) A method for suppressing control failures in an electronic control unit caused by non-numeric floating point data, said method comprising:

performing various control operations based on a predetermined control program, the control operations including a floating-point calculation in which floating-point data stored in a memory is used;

checking whether the memory stores non-numeric data; and

resetting the control operations during normal operations when the checking step determines an existence of non-numeric data in the memory.

37. (New) A method as in claim 36 further comprising:

initializing data in the memory before starting normal control operations when the non-numeric checking step determines the existence of non-numeric data in the memory.

38. (New) A method as in claim 37 wherein:

the initializing data step initializes data in the memory by writing into the memory default values ineffective to control operations.

39. (New) A method as in claim 37 wherein:

the memory is a non-volatile memory which maintains stored data even when the control operations step is in an inoperative condition, and includes a storage area for storing the floating-point data; and

the non-numeric checking step, in initialization processing performed before starting the control operations, performs non-numeric checking for the storage area storing floating-point data.

40. (New) A method as in claim 36 wherein:

the non-numeric checking step performs non-numeric checking at idle time in the various control operations during the normal control operations.